BLACK SPOTS TREATMENTS ON ROUTES IN RURAL AREAS

Jitka Rokytová
Transport research centre, Brno, the Czech Republic

INTRODUCTION

The most suitable procedure to improve road safety is to deal with the accident rate on continuous routes.

Separate safety measures implementation may result in non-homogeneity of routes. If black spots accumulate within a short distance the designed safety measures may affect each other.

Simple low-cost measures may significantly reduce the number of road accidents. In that case we have to know the accident plots.

The biggest problem in the course of routes treatment is the localization of a black spot. The accurate black spot localization is usually found out with the help of road accident investigation form.

1 ROUTES TREATMENT PROCEDURE

It is necessary to stick with the following procedures and use tools for searching and analysing the unsatisfactory road sections and black spots so that the whole length of a route can be assessed objectively:

- selection of routes according to urgency they should be treated,
- routes video recording,
- monitoring of unsatisfactory road sections according to their index of density of losses from accidents,
- monitoring of black spots according to black spots criteria,
- analyses of accidents on unsatisfactory road sections with the help of collision diagrams,
- obtaining other road-engineering data,
- designing road safety measures,
- monitoring of the designed measures effectiveness.
2 ROUTES TREATMENT TOOLS

INDEX OF DENSITY OF LOSSES FROM ROAD ACCIDENTS

A five-level scale was made to assess unsatisfactory road sections according to their accident rate.

level 1 – the road is satisfactory
level 2 – small problems that can be accepted without safety measures implementation
level 3 – intermediate urgency, it is necessary to design road safety measures in future
level 4 – highly urgent, it is necessary to implement road safety measures immediately
level 5 – conflict road section, where immediate remedial steps have to be taken (in some cases make traffic restrictions).

The index of density of losses from accidents corresponds with each level of the scale. This index represents losses from accidents consequences and damage in relation to a road length and a time unit; in this case we use losses per 250m within 2 years. The methodology was produced within the project „Road management system“ by CDV, but it has not been used in the Czech Republic yet.

BLACK SPOTS CRITERIA

It is necessary to find out whether road accidents of the same type cumulate on an unsatisfactory road section and for that we use the black spots criteria.

A road section can be considered as a black spot if it meets the black spots criteria.

In „Methodology of identification and treatment of black spots“, which was produced by CDV in 2001, a criterion was designed, which newly takes into account types of accidents and their consequences.

It is essential to notice the recurrence of road accidents of the same pattern or similar characteristics. The relation between the criterion and the following order of priority in dealing with black spots is also very important.

This new black spots criterion has not been used in the Czech Republic yet.

New Black Spots Criterion

Junctions or 250 m-long road sections are considered as black spots on condition that:
- at least 3 road accidents with injuries occurred within 1 year or
- at least 3 road accidents with injuries of the same type occurred within 3 years or
- at least 5 road accidents of the same type occurred within 1 year.
3 ROAD SAFETY MEASURES ON THE ROAD I/53

The road I/53 is a part of the Brno – Vienna route (figure 1). The route was dealt with last year. It was selected in cooperation with the Road Directorate. Bus companies operate on the route and some parts are also used by agricultural vehicles. The pedestrian and cycling traffic is not insignificant either. The average traffic volume is about 7200 vehicles/24 hours out of which there are 1800 heavy vehicles/24 hours, i.e. approx. 26 % of the average traffic volume.

Figure 1 Map of the Czech Republic
From the graph (figure 2) is obvious that there are 14 road sections on the route I/53 falling into level 4 of priority to be subjected to treatment. Last year the level 4 corresponded with the index of density of losses from road accidents between 7.7 – 38.5 mil CZK.

At one section the index even fell into the level 5. It is a road section with a large number of horizontal curves (at about km 14.9).
Figure 3   The unsatisfactory road sections and their accident types

In the figure 3 the unsatisfactory road sections and their most frequent accident types are shown.

The following sections are considered as unsatisfactory:

6 junctions
2 straight sections
3 horizontal curves that are considered as a single spot
2 vertically segmented sections
1 bridge

The whole presented route should be reconstructed which requires higher financial costs.

Examples of presented spots where low-cost safety measures should be applied are shown as follows:

- a section with a large number of horizontal curves, which is not included in the route reconstruction, because it is not a part of the intended Lechovice bypass
- a junction near Miroslav. Road marking in the junction will be changed.
3.1 THE ROAD I/53 - A SECTION WITH A LARGE NUMBER OF HORIZONTAL CURVES A SECTION BETWEEN 14.2 AND 16.3 KM

The accident spot is behind the village of Lechovice.

Figure 4 Collision diagram from 2001 and 2002

This is the most dangerous spot on the route and road safety measures should be applied.

Another similar characteristics of accidents in this horizontal curve in the collision diagram is the fact that they occurred during night hours (figure 4).
**Designed measures**

Road signing and road studs are among some of the designed measures to stress the horizontal curve during night hours (figure 6, 8).

The black spot – km 15.500

![Figure 5 The horizontal curve in direction to Znojmo](image1)

![Figure 6 The designed measure](image2)

![Figure 7 The horizontal curve in direction to Pohořelice](image3)

![Figure 8 The designed measure](image4)

In case thorough reconstruction takes place the designed measures will include the hard strip extension and the curve widening with traffic lanes separation.
The scheme (figure 9) shows the designed measures along the whole length of horizontally curved section. Apart from road signs "chevron signs", road studs and vegetation planting are designed in the outer side of the curve.

3.2 A JUNCTION NEAR THE TOWN OF MIROSLAV AT KM 24.369

This junction is characterized by one major drawback – inappropriate location and access to the petrol station.

The turning lane, into which vehicles coming from the petrol station enter, starts on the right.

The through traffic lane is shared with the left turning one, which is terminated by give way line.
Collision diagram from 2001 and 2002
Most of the accidents occurred before the junction in direction from Pohořelice. The previous pictures were taken from this direction.
Within 2 years, 7 road accidents occurred, 1 person died and 5 were slightly injured (figure 11).

Description of the existing situation
- Through and left turning lane is shared.
- Vehicles coming out of the petrol station cross over the right turning lane.
- The left turning lane to the petrol station is in the opposite direction.
- The stops are inappropriately located.
The designed measures

Figure 13 The existing scheme

Figure 14 Scheme of the designed measures
It is necessary to:
- build a general access road with a parking place and a drive through the petrol station in one direction. The way out from the petrol station would lead to the minor road.
- cancel the left turning in the direction from Znojmo to the petrol station.
- build separate traffic lanes for through and turning traffic.
- provide perpendicular access of the minor roads into the major one.
- build physical islands separating the opposite traffic lanes on the minor road and separate the right turning and through lane; the islands could be green.
- cancel the stops because the area in front of the petrol station does not allow satisfactory location of the stop for buses coming from Znojmo. The stop in the opposite direction is not designed well.

The stops should be moved to the minor roads or the buses should go to the adjacent villages.

### 4 Low-cost road safety measures in urban areas

- emphasizing the route with the help of road signing and vegetation,
- emphasizing junctions with the help of road signing, physical islands raised over the road pavement or low vegetation islands,
- emphasizing the pedestrian crossings with physical islands, road signs and traffic facilities,
- raising the marked edge lines of traffic lanes in order to separate motorised traffic from pedestrian traffic,
- moving public transport stops
- guiding vehicles with the help of islands and diagonal hatching
- building separate turning lanes
- installing road studs
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Table 1 Overview of the road safety measures effectiveness in rural areas

Legend:

- **no** unsuitable measures
- **x** little-effective measures
- **xx** medium-effective measures
- **xxx** very effective measures
- **yes** the most effective measures
- **not considered**
REFERENCES


V. Fencl, Z. Koňárek, J. Andres. Systém hospodaření s pozemními komunikacemi. (Road Management System). CDV Brno


other materials, Czech standards, Technical Guidelines for the Czech Republic.